

# THE INJURIOUS EFFECTS OF ULTRA-VIOLET AND INFRA-RED RADIATIONS ON PLANTS

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## 1. PREVIOUS WORK

Numerous investigations have demonstrated that the radiations emanating from unscreened carbon and quartz-mercury-vapor arcs are decidedly injurious to plant tissue. These effects are quite striking: leaves are glazed and bronzed, the upper epidermis is burned off, stems made brittle, growth stunted. The manifestations of injury have in general been attributed to the ultra-violet wave lengths generated by the arcs; possible effects of the infra-red portion of the spectrum have been almost entirely neglected, not only in the earlier works, but as late as 1929.

Delf, Ritson, and Westbrook ('27) rayed seedlings of *Arachis* and *Trifolium* at 24 inches from a mercury arc and reported injuries which they attributed to ultra-violet. Popp and Brown ('28) rayed cucumbers, turnip, and other species of plants at a distance of 50 cm.—only 20 inches—from an unscreened mercury vapor arc and found that “ultra-violet radiation caused only injury to all the seedlings used.” Newell and Arthur ('29) rayed tomato plants at 15 inches with the full spectrum of the mercury vapor arc and wrote of the injurious effects induced by “ultra-violet radiation.” It seems incredible that the injury produced in plants when they are irradiated at such short distances from the arc is attributable exclusively to ultra-violet radiation. Intensity measurements made in this laboratory show that at such close proximity to the arc, the infra-red radiation may constitute as much as 90 per cent of the total energy output of the arc. In view of this condition it seems that the infra-red radiation might account for a considerable part of the injury usually referred to the ultra-violet portion of the spec-